FIGURE 1

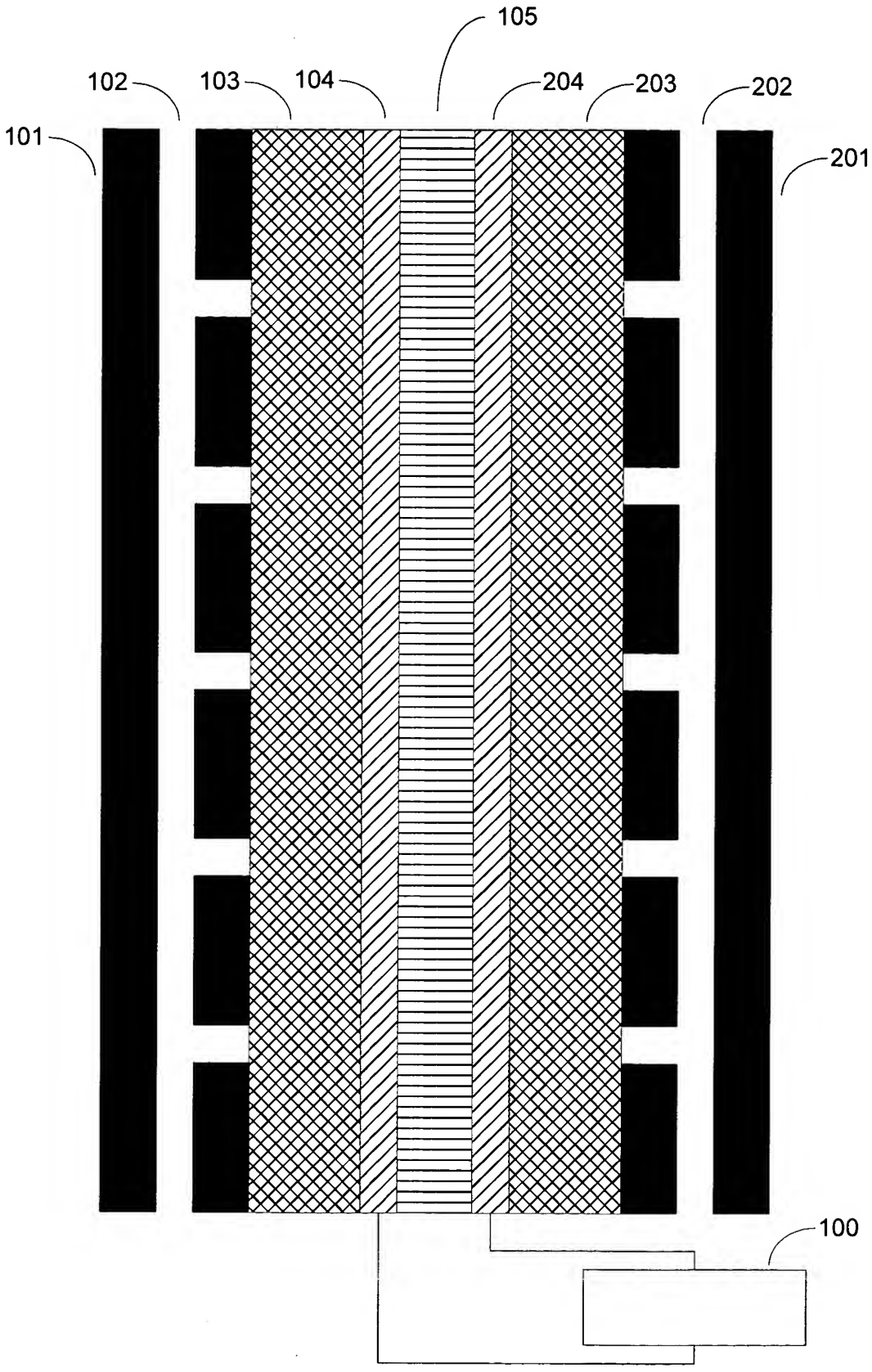


Figure 2

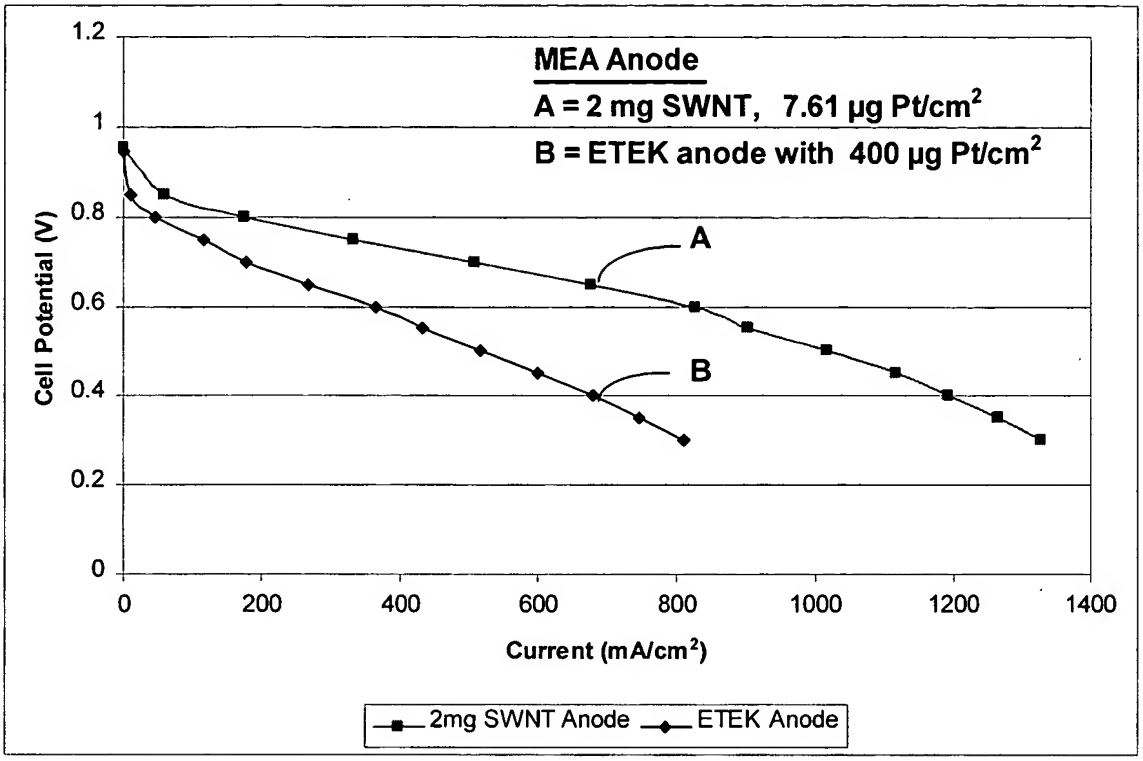

MEA Anode
A = 2 mg SWNT, 7.61 µg Pt/cm2
B = ETEK anode with 400 µg Pt/cm2
A
B
Cell Potential (V)
1.2
1
0.8
0.6
0.4
0.2
0
0
200
400
600
800
1000
1200
1400
Current (mA/cm2)
2mg SWNT Anode
ETEK Anode

Figure 3

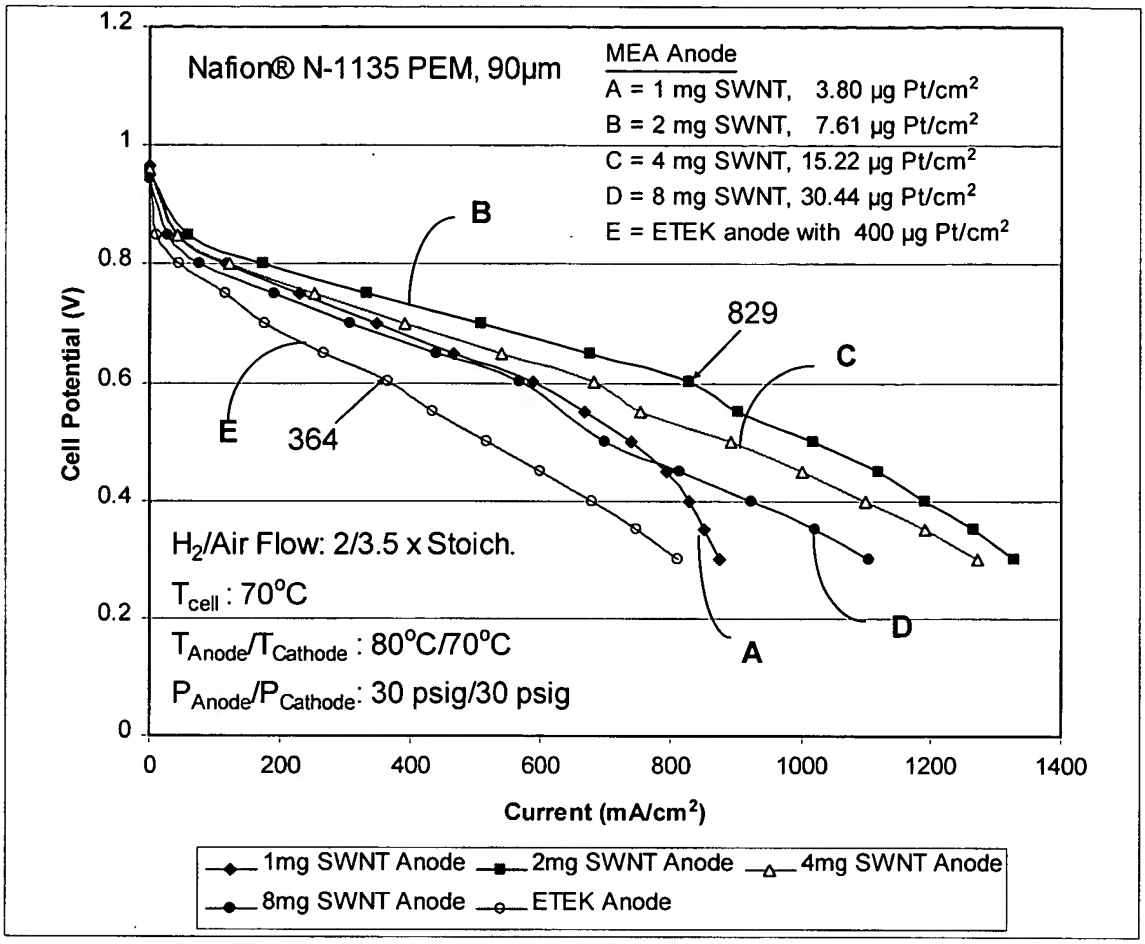

Nafion® N-1135 PEM, 90µm
MEA Anode
A = 1 mg SWNT, 3.80 µg Pt/cm²
B = 2 mg SWNT, 7.61 µg Pt/cm²
C = 4 mg SWNT, 15.22 µg Pt/cm²
D = 8 mg SWNT, 30.44 µg Pt/cm²
E = ETEK anode with 400 µg Pt/cm²
B
829
C
E
364
A
D
H2/Air Flow: 2/3.5 x Stoich.
Tcell : 70°C
TAnode/TCathode : 80°C/70°C
PAnode/PCathode: 30 psig/30 psig
Cell Potential (V)
Current (mA/cm²)
1mg SWNT Anode
2mg SWNT Anode
4mg SWNT Anode
8mg SWNT Anode
ETEK Anode

Figure 4

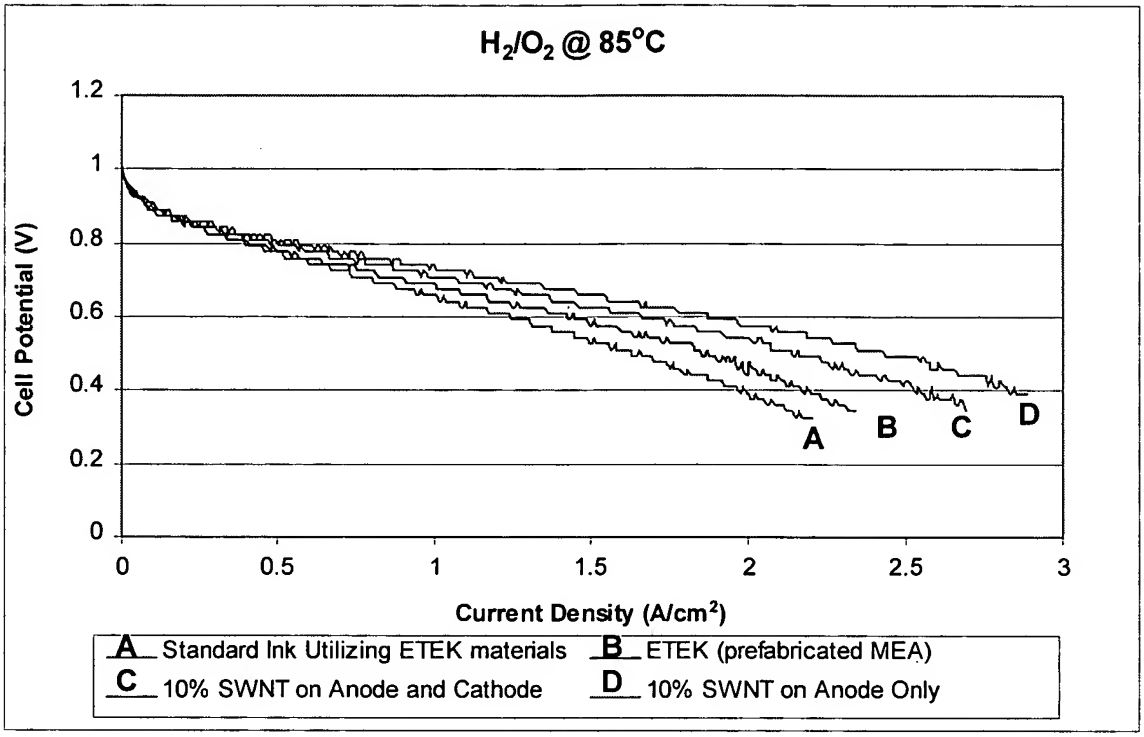

H_2/O_2 @ 85°C
Cell Potential (V)
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
3
Current Density (A/cm²)
A
B
C
D
A Standard Ink Utilizing ETEK materials
B ETEK (prefabricated MEA)
C 10% SWNT on Anode and Cathode
D 10% SWNT on Anode Only

Figure 5

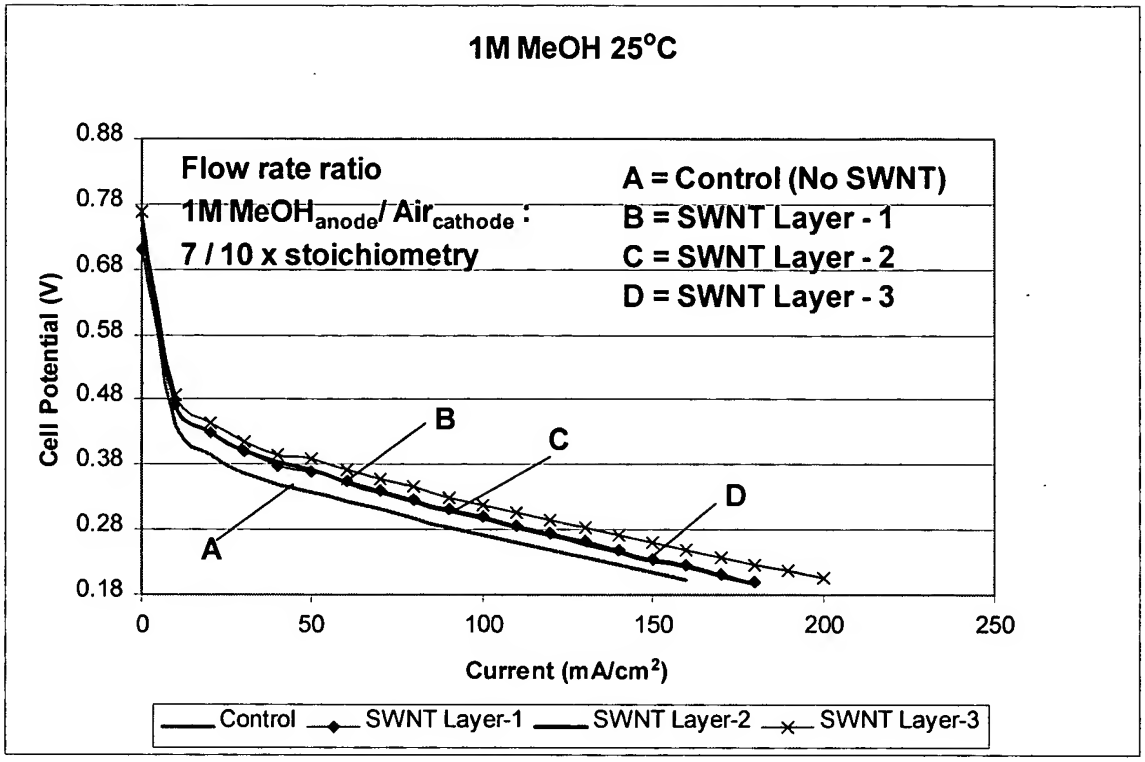

1M MeOH 25°C
Flow rate ratio
1M MeOH anode / Air cathode :
7 / 10 x stoichiometry
A = Control (No SWNT)
B = SWNT Layer - 1
C = SWNT Layer - 2
D = SWNT Layer - 3
Cell Potential (V)
0.88
0.78
0.68
0.58
0.48
0.38
0.28
0.18
0
50
100
150
200
250
Current (mA/cm²)
Control
SWNT Layer-1
SWNT Layer-2
SWNT Layer-3

Figure 6

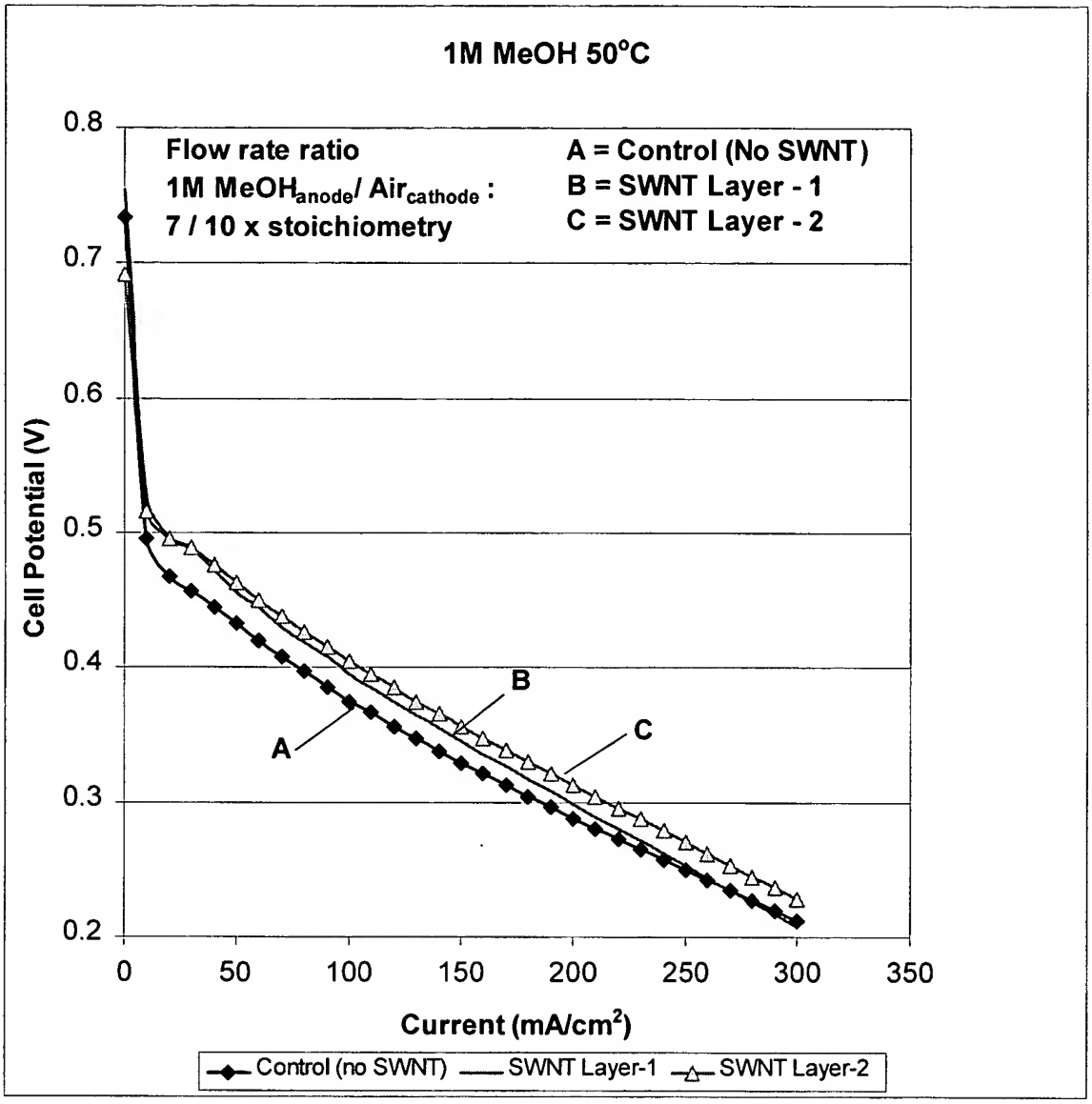
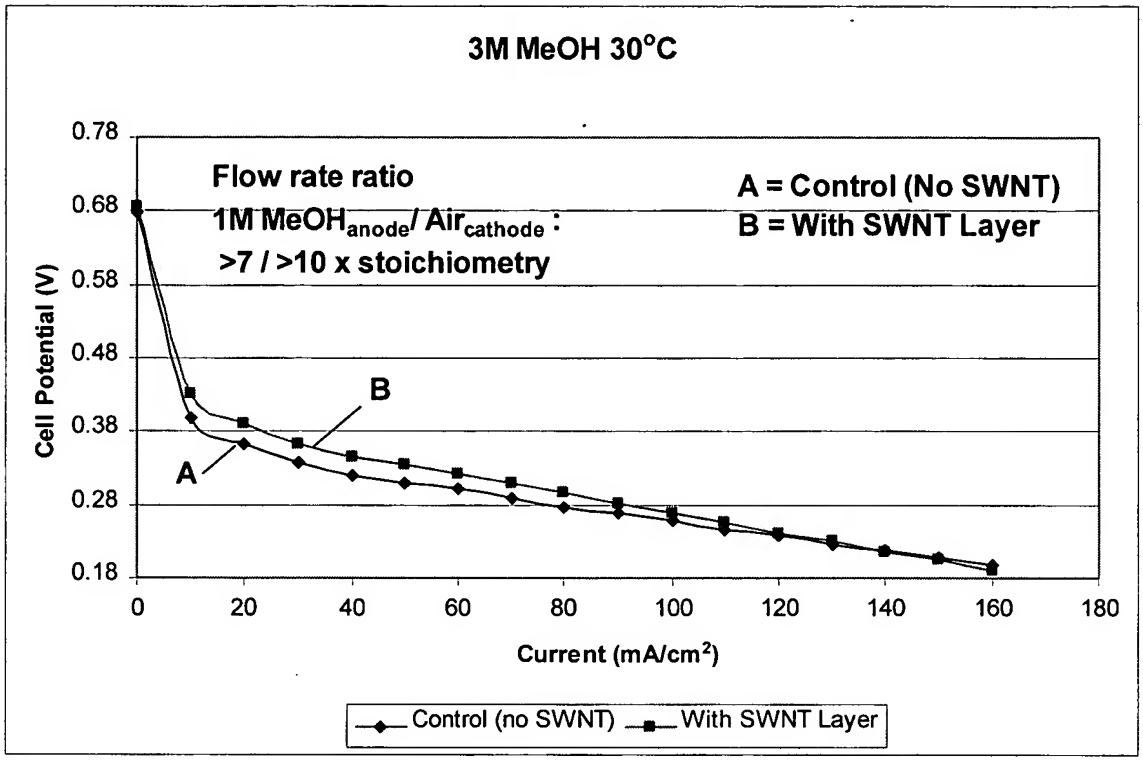

1M MeOH 50°C
Flow rate ratio
1M MeOH$_{anode}$/ Air$_{cathode}$:
7 / 10 x stoichiometry
A = Control (No SWNT)
B = SWNT Layer - 1
C = SWNT Layer - 2
Cell Potential (V)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0
50
100
150
200
250
300
350
Current (mA/cm^2)
A
B
C
Control (no SWNT)
SWNT Layer-1
SWNT Layer-2

Figure 7


3M MeOH 30°C
Flow rate ratio
1M MeOH anode / Air cathode :
>7 / >10 x stoichiometry
A = Control (No SWNT)
B = With SWNT Layer
Cell Potential (V)
0.78
0.68
0.58
0.48
0.38
0.28
0.18
A
B
0
20
40
60
80
100
120
140
160
180
Current (mA/cm2)
Control (no SWNT)
With SWNT Layer